A new Wiener-Hopf identity for a general class of reflected processes

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Abstract

We derive a new “Wiener-Hopf identity” for a class of preemptive-resume queueing systems, with batch arrivals and catastrophes that, whenever they occur, eliminate multiple customers present in the system. These processes are quite general, as they can be used to approximate Lévy processes, diffusion processes, and certain types of growth-collapse processes: thus, all of the processes mentioned above also satisfy this type of Wiener-Hopf identity. In the Lévy case, this identity simplifies to the well-known Wiener-Hopf factorization. We also show how the ideas can be used to derive transforms for some well-known state-dependent/inhomogeneous birth-death processes and diffusion processes.

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